Maximum Likelihood Reconstruction for Emission Tomography

Team Members:

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Results:

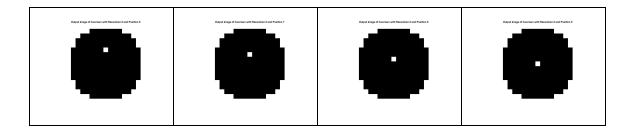
Number of detectors = 40

- Reconstruction of Single Pixel Impulse
 - 1. Resolution = 4 (9*9 image)

Input Images					
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EM Output					
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Inversion Output					
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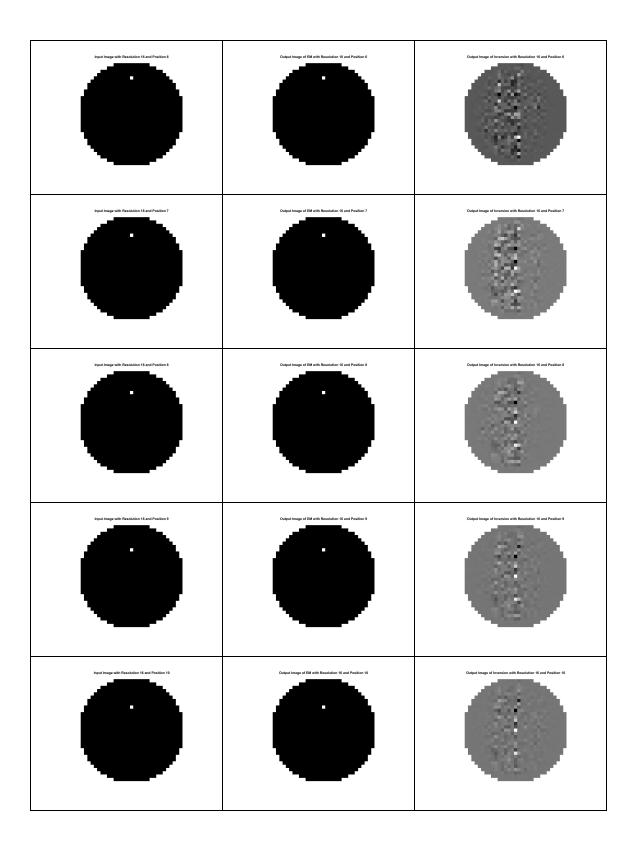
2. Resolution = 8 (17*17 image)

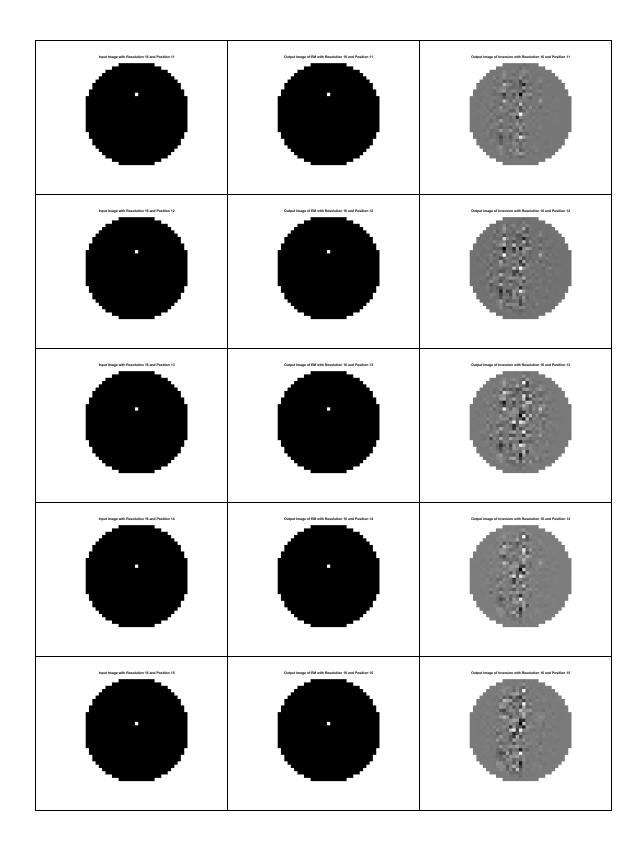
Input Images				
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Inversion Output				
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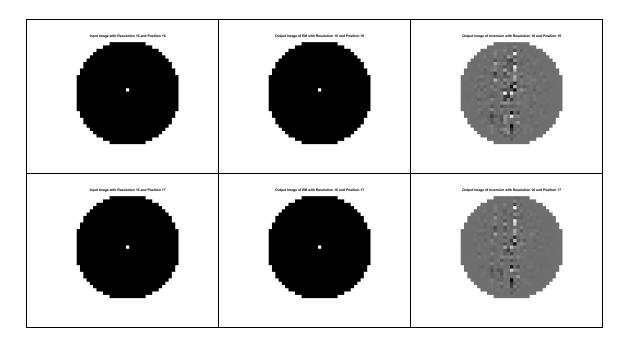


3. Resolution = 16 (33*33 image)

Input Image	EM Output	Inversion
inquit Image with Resolution 16 and Procition 2	Output Image of EM with Recolution 16 and Position 2	Output Image of Inversion with Resolution 16 and Position 2
Input Image with Resolution 16 and Position 3	Output Image of EM with Resolution 16 and Position 3	Output Image of Inversion with Resolution 16 and Position 3
Inquit Image with Resolution 16 and Position 4	Output Image of EM with Resolution 16 and Position 4	Output Image of Inversion with Resolution 16 and Position 4
Input Image with Resolution 16 and Position 5	Output Image of EM with Resolution 16 and Position 5	Output image of Invention with Resolution 16 and Position 5

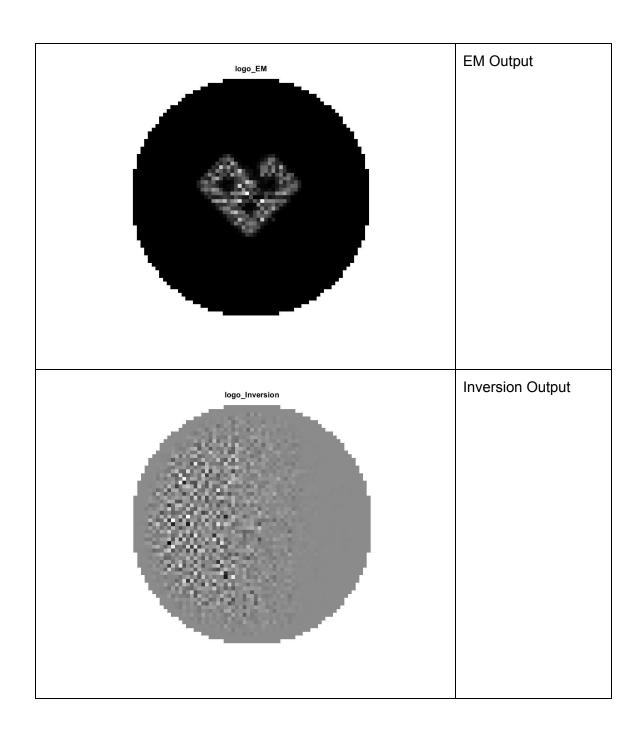






Reconstruction of Binary Image
 Number of detectors = 80
 Resolution = 32 (65*65 image)

Images	Description
logo_input	Input Binary Image (logo)



Theory Concerning Project

Here b' denote sites, there are B' sites in total

I denote detector tube and there are D' tubes in total.

P(b,d) is the probability that emission in b' is detected in tube d'. The emission at site b' is assumed to be poisson with mean X(b)

nx(a) is the total number of emission detected in tube a' during acquisition (real data)

nibid) denote the number of emission in b detected in d?

nibid) are mutually independent poisson random variable, across b,

across d? (split of poisson places independent)

n(1)d) N Poisson (x(b,d))

(bod) = x(b) x P(b)d)

$$n(d) = \sum_{b=1}^{R} h(b)d) \Rightarrow \chi^{*}(d) = \sum_{b=1}^{R} \chi(b) P(b)d)$$

 \exists Best estimate of $\lambda^*(d) = n^*(d)$

Above set of linear equations form the basis to inversion reconstruction.

Now let's move on to expectation modification. If we have number as hidden rendom variable then, estimation of ALD) becomes very easy.

So x = Hidden Rondom Variable = nubod) (b) *n = ptab basised = p*(d) The extend) (bid) (coch nobid)

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hilling independent) likelihood = PCXXY) = (Enchod) = n*(d) +d) Toprouse as does not contain (bod) (bod) $E[N(b)d)[N*(d) = \frac{n^{*}(d) \lambda^{*}(b)d}{B}$ $E[N(b)d)[N*(d) = \frac{n^{*}(d) \lambda^{*}(b)d}{B}$ i'(b)d) = estimate at ith iteration $\Rightarrow \pm [\log likelihood] = \frac{2}{E} \frac{E}{E} - \lambda(b,d) + \frac{n^*(d) \lambda'(b,d)}{E \lambda'(b',d)} \log (\lambda(b,d)) = O(0.01)$ Differentiating above with respect to ALDID to get moxima $=) \quad \lambda(b,d) = \frac{n^*(d) \lambda(b,d)}{\varepsilon^2 \lambda(b',d)} \qquad \lambda(b,d) = \lambda(b) P(b,d)$ $\lambda(b) = \int_{E_1}^{P} \lambda(b) d$ =) $\lambda(b) = \lambda(b) = \frac{D}{\sum_{b=1}^{\infty} \lambda_{old}(b') P(b,d)}$ Final Pointal for update is given below $\lambda^{\text{new}}(b) = \lambda^{\text{id}}(b) \stackrel{\mathcal{D}}{\leq} \frac{n^{*}(d) \, P(b) d}{8 \, \hat{\lambda}_{\text{old}}(b) \, P(b', d)}$